

(No Model.)

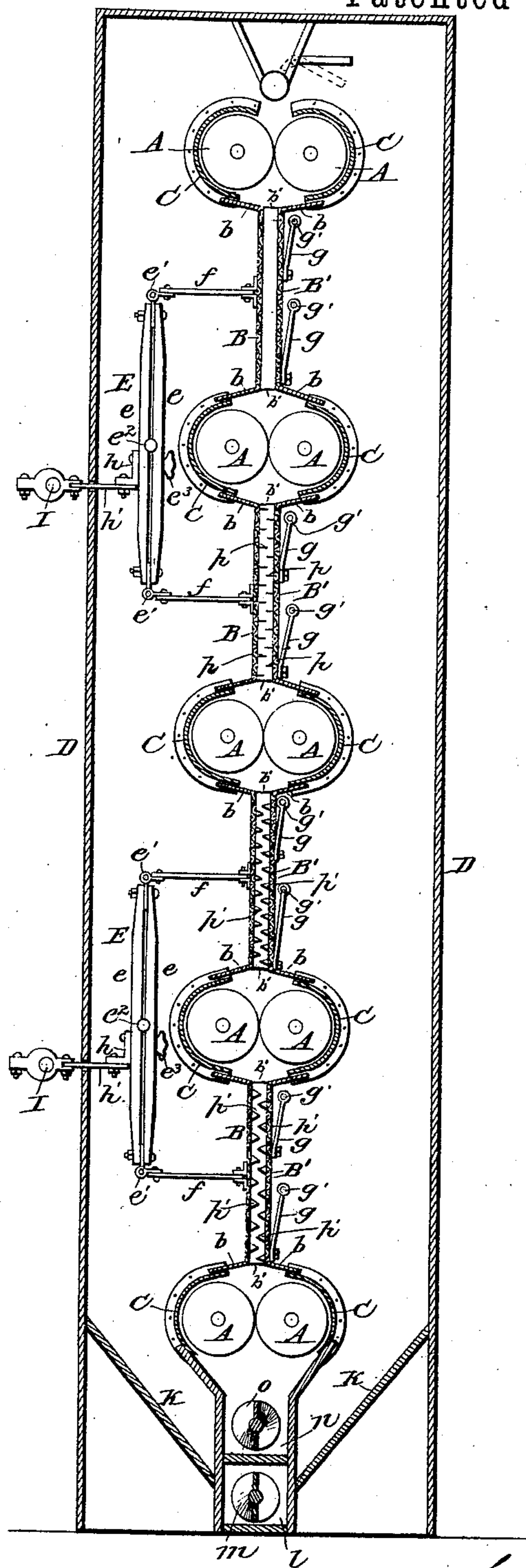
2 Sheets—Sheet 1.

W. TENNANT.
ROLLER GRINDING MILL.

No. 275,542.

Patented Apr. 10, 1883.

Fig. 1.



Witnesses:
A. M. Long.
E. P. Walker

Inventor.
William Tennant
by his attorney
J. E. E. E.

(No Model.)

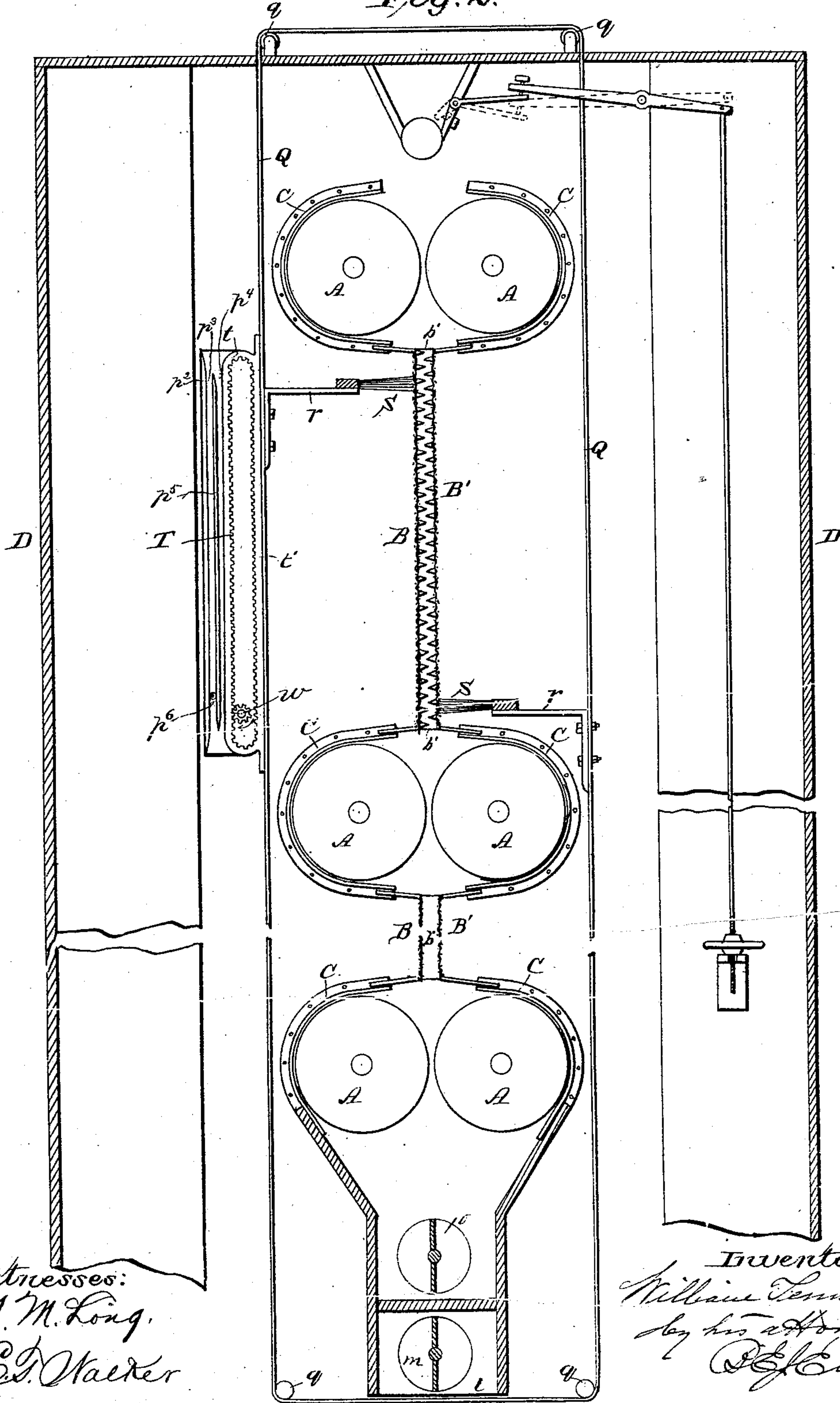
2 Sheets—Sheet 2.

W. TENNANT.
ROLLER GRINDING MILL.

No. 275,542.

Patented Apr. 10, 1883.

Fig. 2.



Witnesses:
A. M. Long,
E. J. Walker

Inventor.
William Tennant
by his attorney
J. E. Kils

UNITED STATES PATENT OFFICE.

WILLIAM TENNANT, OF FARIBAULT, MINNESOTA.

ROLLER GRINDING-MILL.

SPECIFICATION forming part of Letters Patent No. 275,542, dated April 10, 1883.

Application filed November 16, 1882. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM TENNANT, a citizen of the United States, residing at Faribault, in the county of Rice and State of Minnesota, have invented certain new and useful Improvements in Roller Grinding-Mills; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates generally to devices for separating the fine flour and middlings from the chop delivered from the reducing devices of grain-grinding mills, and particularly to the application of such separating devices to mills of that class in which pairs of rollers are employed to crush the grain and recrush the chop as it passes between them.

In screening devices as heretofore constructed the chop slides upon the screens, and the bran is thus subjected to a more or less violent attrition, which results in the rubbing therefrom of fine yellow flakes and dust, which become practically inseparably mixed with the flour and reduce its quality.

The object of my invention is to secure a thorough separation of the fine flour and middlings from the chop and at the same time to prevent such attrition of the bran as would result in the detachment therefrom of flakes and yellow dust-like particles which would become mixed with the flour; and to this end my improvement consists, first, in a screening apparatus composed of two upright screens facing each other and separated by an intermediate space adapted to permit the passage of the chop or other material between said screens, and suitable mechanism for vibrating the screens facewise, whereby the chop, as it passes, is thrown from one screen against another alternately, part of the fine flour and middlings passing through the meshes of each screen as the chop strikes it, while the coarser portion of the chop and the not yet eliminated flour and middlings are thrown back against the opposite screen for further separation. It will thus be seen that the contact of the chop with the screens is almost entirely one of impact, which causes but insignificant attrition of the bran, and therefore no appreciable quantity of bran dust or flakes will become mixed with the fine flour.

My improvement consists, secondly, in the combination, with two facing upright screens and devices for vibrating them facewise, of one or more baffle plates or ribs attached to and projecting inwardly from one or both screens, whereby the passage of the chop or other material is retarded, and the separating action of the screens upon the same prolonged for the purpose of insuring a complete separation of the finer from the coarser portion.

My improvement consists, thirdly, in the combination, with a pair of grain grinding or crushing rollers arranged in practically horizontal order, of a pair of vertical screens arranged under said rollers and separated from each other by an intervening passage-way, the upper end of which is arranged to receive the chop which passes between and falls from said rollers, and mechanism for vibrating said screens facewise, whereby the chop will be thrown back and forth against the screens alternately, and have separated therefrom the fine flour and middlings, while the coarser portion of the chop passes out at the lower end of the passage-way.

My improvement consists, fourthly, in the combination, with a series of screens and a series of traversing cleaning-brushes, of a novel arrangement of devices for operating said brushes to clean the sieves, as will be hereinafter particularly described.

In the accompanying drawings, Figure 1 is a vertical transverse section of a roller grinding-mill embodying parts of my invention. Fig. 2 is a similar section in a different plane of a portion of a mill, illustrating another part of my invention.

Fig. 1 represents a roller grinding-mill having five pairs of grinding-rollers, A A, in vertical series of pairs, and between each two pairs of rollers is arranged a pair of vertical separating-screens, B B', the two screens of each pair being connected at their ends by plates b', but separated between their ends by an intervening passage-way, the upper end of which is arranged to receive the chop falling from the rollers above and its lower end to discharge it into the bite of the next pair of rollers below. The pairs of rollers are respectively partly surrounded by casings C, preferably of sheet-iron, to prevent any portion of the chop from being thrown outside of the

screens. The tops and bottoms of the screens are bent laterally, as shown at *b*, to lap past the edges of these casings.

Within the chest *D*, which incloses the mill, are arranged vertical centrally-pivoted levers *E E*, each composed of two bars, *e e*, bolted together and clamping between their ends one of the wings of each of two hinges, *e'*, the other wings of which are secured to the ends of rods *f*, the other ends of which are secured to the ends of separate screens *B*, the screens *B'* opposite to which have their ends attached to spring-arms *g*, depending from pivots *g'*, fixed in the end walls of the chest *D*. Each pair of screens is thus supported in a manner to allow of its ready lateral vibration, as it will be understood that the drawings show the supporting devices at only one end of the screens, the other end being similarly supported. The pivot-pins *e²* of the levers *E E* are clamped between the two bars of said levers, and by means of thumb-screws *e³* the bars may be drawn toward each other to take up wear of the pivot-bearings.

Each of the levers *E* has attached to its outer side, at one side of its fulcrum, an angle-plate, *h*, by means of a screw which passes through a slot formed in said plate, the projecting portion of said plate having connected to it a rod, *h'*, which extends through the wall of the chest, and has its outer end connected to the strap of an eccentric on a rotary shaft, *I*, outside of the chest. When the shafts *I* are rotated the levers *E* are oscillated on their pivots and a vibratory motion is communicated to the connected pairs of screens through the rods *f*, and the chop, falling between the screens, will be thrown back and forth against their surfaces alternately, the fine flour and middlings passing through the meshes and falling to the lower portion of the chest, where they are guided by oblique boards *k k* to a chamber, *l*, whence they are removed by a conveying-screw, *m*. The last break falls from the lowermost pair of rollers into a chamber, *n*, from which it is removed by a conveyer-screw, *o*.

The screens of the upper pair of rollers have plain inner surfaces, so that the chop is not impeded in its passage except by the lateral throw it receives from the screens; but the screens of the next lower pair have their inner surfaces provided with inwardly-projecting baffle-plates or narrow flat shelves *p*, the baffle-plates of one screen being arranged opposite the spaces between the similar plates of the other screen, so that the chop, in being thrown from one screen and falling obliquely, will lodge upon the plates of the opposite screen, its passage being thus retarded and the action of the screens upon it prolonged, a longer time being also allowed for the cooling of the chop in its transit from one pair of rollers to another.

The third and fourth pairs of screens from the top are shown as having their inner sur-

faces provided with modified forms of plates or shelves *p'*, having inclined surfaces, which, while preventing the chop from falling too rapidly to the lower roller, will have a less retarding effect than the directly horizontal plates. Either or all of the pairs of screens may, however, be provided with baffle-plates of either of the forms shown, as may be deemed advantageous, or only one screen of each pair may be so provided.

In Fig. 2, which illustrates the application of traversing brushes for cleaning the screens, the letter *Q* indicates an endless belt of band-iron having vertical portions on opposite sides of the series of rollers and screens and passing laterally around guide-pulleys *q q q q*, arranged in pairs at the top and near the bottom of the chest *D*, respectively, in proper positions to guide the belt vertically.

From the inner surface of the belt, on both sides of each pair of screens *B*, arms *r* project toward the screens and carry at their ends brushes *S*, the bristles of which come in contact with the outer surfaces of said screens, the brushes being so arranged on opposite sides of the screens that when the brushes on one side are at the tops those on the other side will be at the bottoms of their respective screens. Thus when the belt is in motion the brushes on opposite sides will travel in opposite directions, those on one side moving upward while those on the other side move downward.

To the outer surface of the belt *Q*, at one side of the mill, is secured a double or reversing rack, *T*, between the two rack-bars *t t'* of which is arranged a rotary pinion, *u*, fixed upon a horizontal rotary shaft, which may be mounted in suitably-arranged bearings and driven by belt-connection with any convenient rotary part of the mill or its driving-engine. Devices of the usual character are provided for causing the pinion to engage alternately with opposite rack-bars, so that after having driven one bar its full length in one direction it will be shifted to the other bar and drive it its full length in the opposite direction. A reversing travel will thus be given to the belt, which will cause the brushes to traverse the outer surface of the screens upward and downward alternately and keep the meshes thereof from becoming clogged.

In the particular form of reversing-gear shown in the drawings a plate, *p²*, projects from one side of the double rack *T*, said plate having parallel longitudinal passages *p³ p⁴*, open at bottom and top and separated by a rib, *p⁵*, which is preferably pointed at both ends. A fixed stud, *p⁶*, carrying a friction-roller, is arranged to extend into one or the other of these passages, according to the position of the plate *p²*. The pinion *w*, rotating in the direction of the arrow, drives the rack *t* upward, and on reaching the lower end of said rack forces it to one side by taking into the curved series of teeth at the bottom. At this

time the plate p^2 has been carried so far up that the stud p^6 is out of the passage p^3 , and as the plate moves to one side the entrance to passage p^4 is brought directly over the stud, which enters said passage as the pinion, taking into the first tooth of rack t' , forces said rack downward, and the stud thus serves as a guide, which holds said rack in engagement with the pinion until the curved upper portion of the rack is brought down to said pinion, at which time the stud will be out of passage p^4 , and the double rack will be forced to one side and raised, so that the stud will again enter passage p^3 to hold the rack t in engagement with the pinion. It is obvious that by the operation of these devices the motion of the double rack will be alternately reversed as long as the pinion is kept in rotation.

Having now described operative mechanism for carrying out my invention, I wish it to be understood that I do not confine myself to the particular devices or combinations thereof which are shown in my drawings, but may vary the same in any manner within the known practice of mill construction, or by the substitution of mechanical equivalents for accomplishing the purposes sought, without departing from the true spirit and scope of my invention.

What I claim is—

30 1. A screening apparatus composed of two upright screens facing each other and separated by an intermediate space adapted to permit the passage of the material to be screened, and suitable mechanism for vibrating the

35 screens facewise for the purpose of throwing the material laterally against said screens alternately, substantially as described.

2. The combination, with two facing upright screens and devices for vibrating them facewise, of one or more baffle plates or ribs attached to and projecting inwardly from one or both screens, substantially as and for the purpose set forth.

3. The combination, with a pair of grain grinding or crushing rollers arranged in practically horizontal order, of a pair of vertical screens arranged under said rollers and separated from each other by an intervening passage-way, the upper end of which is arranged to receive the chop which passes between and falls from said rollers, and mechanism for vibrating said screens facewise, substantially as and for the purpose set forth.

4. The combination, with a series of pairs of vertical screens, substantially as described, of the endless belt having portions of its length on opposite sides of said pairs of screens, the brushes carried by said belt and in contact with screens of each pair, and mechanism for giving to said belt longitudinal motion in alternately-opposite directions, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM TENNANT.

Witnesses:

CHAS. J. HUMPHREY,
CHAS. E. WHITE.